

REMARKS

Claims 1-18 and 20-45 are pending. Claim 19 has been canceled.

Claims 1, 3, 14, 31-36 and 43-45 are amended.

Claims 1 and 14 have been amended by setting the lower limit of y to 0.16 which is based on the fact that Co has a composition ratio of 0.16 in the composition of Synthesis Example 5 shown in Table 1.

Claims 31 and 33 have been rewritten in independent form. Also, the ratio of Ni, Mn and M are no longer represented by integers, but are now rewritten in the form of General Formulae based on the paragraph beginning on page 4, line 27. Similarly, the recitations in claims 34 to 36 are rewritten in the form of General Formulae.

Support for the amendment to claims 43-45 can be found on page 6, beginning at line 28.

No new matter has been added by way of the above-amendment.

[I] Prior Art Based Rejections

The following prior art based rejections are pending:

1. Claims 1-4, 16-18, 31, 34, 37, 40 and 43 are rejected under 35 U.S.C. § 102(b) as being anticipated by Miyasaka (6,416,902);
2. Claims 14-15, 29-30, 33, 36, 39, 42 and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyasaka; and
3. Claims 5-13, 20-28, 32, 35, 38, 41 and 44 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyasaka in view of Pynenburg et al. (5,429,890) and in further view of Gorge et al. (6,015,447).

Applicants respectfully traverse all of the rejections.

[IA] Rejection (1):

The Examiner appears to be of the position that claim 1, as appearing in the June 26, 2006 Amendment is not patentable over the teachings of Miyasaka. Applicants respectfully disagree. However, in order to advance prosecution, Applicants have amended claim 1 to recite a lower limit for "y." Specifically, claim 1 has been amended to recite that the lithium-containing complex oxide represented by $\text{Li}_{1+x+\alpha}\text{Ni}_{(1-x-y+\delta)/2}\text{Mn}_{(1-x-y-\delta)/2}\text{M}_y\text{O}_2$ (where the difference δ in ratio between Ni and Mn is in the range of $-0.1 \leq \delta \leq 0.1$ and the ratio y of an element M other than Ni and Mn is in the range of $0.16 \leq y \leq 0.4$) is used as an active material for an electrode.

On the other hand, Miyasaka discloses a positive electrode active material represented by $\text{Li}_x\text{Ni}_{1-y}\text{Co}_{y-z}\text{M}_z\text{O}_{2-a}\text{X}_b$ as pointed out by the Examiner. Miyasaka requires $0 < y \leq 0.5$ and $0 < z < 0.5$ in the above-noted composition (see column 2, lines 41 to 54). By studying the composition condition mentioned above, the following description will show that Miyasaka does not disclose the present invention.

Since $y \leq 0.5$ in the General Formula in Miyasaka, the ratio $1-y$ of Ni is always equal to or greater than 0.5. On the other hand, in order to set the difference in ratio between Ni and Mn to be in the range of not greater than 0.1 as in the present invention, it is necessary to select Mn as M and set the ratio z of M to be equal to or greater than 0.4 in the General Formula in Miyasaka. However, since the sum of the ratios of Ni, Co, and M is 1, it is necessary for satisfying the above-mentioned condition to set the ratio of Co other than Ni and Mn not to be greater than 0.1. In other words, in Miyasaka, when the difference $1-y-z$ in ratio between Ni and Mn is in the range of $-0.1 \leq 1-y-z \leq 0.1$, the ratio of elements other than Ni and Mn cannot be made greater than 0.1. Thus, since the lithium-containing complex oxide according to the amended claim 1 of the present application has a ratio y of the element M other than Ni and Mn of equal to or greater than 0.16, it has a different composition from the positive electrode active material disclosed by Miyasaka.

Further, the compositions represented by $\text{LiNi}_{5/12}\text{Mn}_{5/12}\text{M}_{1/6}\text{O}_2$ recited in the amended claims 31 to 33 of the present application are not disclosed by Miyasaka, either. In this General

Formula, the ratios of Ni and Mn are 5/12 (=0.417), and the ratio of the other elements such as Co is 1/6 (=0.167). On the other hand, the composition in the General Formula disclosed by Miyasaka is closest to the above-noted composition ($\text{LiNi}_{5/12}\text{Mn}_{5/12}\text{M}_{1/6}\text{O}_2$) when $y = 0.5$ and $z = 0.417$. However, even in this case, the ratio $1-y$ of Ni (= 0.5) is 17% greater than the ratio of Ni (= 0.417) in the above-noted composition of the present invention, and the ratio $y-z$ of Co (= 0.083) is only 1/2 of the ratio of Co (=0.167) in the above-noted composition of the present invention. Therefore, one would not reasonably conclude that the composition in the vicinity of $\text{LiNi}_{5/12}\text{Mn}_{5/12}\text{M}_{1/6}\text{O}_2$ is disclosed by Miyasaka. Moreover, the compositions represented by $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{M}_{1/3}\text{O}_2$ recited in the amended claims 34 to 36 of the present application are also far away from the composition disclosed by Miyasaka, and one would not reasonably conclude that the composition in the vicinity of $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{M}_{1/3}\text{O}_2$ is disclosed by Miyasaka, either.

As the MPEP directs, all the claim limitations must be taught or suggested by the prior art to establish a *prima facie* case of anticipation. See MPEP §§ 2131. As described above, the limitations of amended claims 1, 31 and 33 of the present application are not disclosed by Miyasaka. Thus, independent claims 1, 31 and 33 are patentable over Miyasaka. It also follows that claims 2 to 4, 16 to 18, 34, 37, 39, 40 and 43 depending therefrom are not disclosed by Miyasaka, either.

Applicants submit that claims 43-45 are further distinguished from Miyasaka. Although the Examiner has asserted that column 5, lines 60 to 61 in Miyasaka discloses that the positive electrode mixture has a density of at least 2.9 g/cm³, what is described in the above-mentioned text is not the density of the positive electrode mixture but is the tap density of the active material itself. As mentioned in the June 26, 2006 Amendment, the density of the positive electrode mixture containing the positive active material and the binder is calculated to be 2.6 g/cm³ from Examples in Miyasaka, which is only a value at least 10% smaller than the mixture density defined by claims 43 to 45 of the present application. Therefore, as mentioned in the June 26, 2006 Amendment, it is clear that the present invention achieves a remarkable effect of increasing the density of the positive electrode mixture, which makes it possible to constitute a positive electrode suitable for higher capacity.

[IB] Rejection (2):

The Examiner has included independent claim 14 in Rejection (2). As the Examiner will note, claim 14 has been amended in a similar fashion to claim 1 with respect to the lower limit of "y." Both amended claims 1 and 14 are characterized in that a lithium-containing complex oxide where the difference δ in ratio between Ni and Mn is in the range of $-0.1 \leq \delta \leq 0.1$ and the ratio y of an element M other than Ni and Mn is in the range of $0.16 \leq y \leq 0.4$ is used as an active material for an electrode. As already described above, the above-noted composition range is excluded from the invention of Miyasaka, and the compositions recited in the amended claims 33 and 36 of the present application are also excluded from Miyasaka. As the MPEP directs, all the claim limitations must be taught or suggested by the prior art to establish a *prima facie* case of obviousness. See MPEP § 2143.03. Thus, the inventive compositions (recited in the amended claims 14, 33 and 36 of the present application) include features not taught by Miyasaka, and as such, cannot be rendered obvious over Miyasaka.

Furthermore, considering the fact that Miyasaka fails to disclose that the secondary particles having a mean particle diameter of 5 to 20 μm are set to be in a ratio of 60% to 90% by weight and the secondary particles having a mean particle diameter of not greater than 3/5 of the mean particle diameter of 5 to 20 μm are set to be in a ratio of 10% to 40% by weight, the inventions according to claims 14, 33 and 36 of the present application characterized by the combination of the above-mentioned composition and the particle distribution by no means can be rendered obvious over Miyasaka. Moreover, since claims 15, 29, 30, 39, 42 and 45 depend from these claims, they cannot be rendered obvious over Miyasaka, either.

[IC] Rejection (3)

The Examiner includes independant claim 5 in Rejection (3). Applicants respectfully submit that independent claim 5 is patentable over the combination of Miyasaka, Pynenburg et al. and Gorge et al.

Pynenburg et al. aim to use a complex oxide ($\text{Li}_x\text{Mn}_2\text{O}_4$) with a spinel structure whose discharge curve has a plurality of potential plateaus and steps mixed with at least one complex oxide selected from

Li_xNiO_2 and Li_xCoO_2 , thereby removing the steps and achieving a smooth discharge curve. The Examiner has asserted that, since Pynenburg et al. disclose Li_xCoO_2 as the lithium-containing complex oxide, it can be combined with Miyasaka so as to make the structure of the present invention. However, Miyasaka and Pynenburg et al. cannot be combined for the reason described below.

$\text{Li}_x\text{Mn}_2\text{O}_4$ described in Pynenburg et al. is characterized by having a spinel crystal structure and a discharge curve including steps. Thus, it is possible to make the discharge curve smooth by combining $\text{Li}_x\text{Mn}_2\text{O}_4$ with Li_xCoO_2 . On the other hand, $\text{Li}_{x-y}\text{Ni}_{y-z}\text{Co}_{z-a}\text{M}_a\text{O}_{2-a}X_b$, described in Miyasaka has both a composition and a crystal structure that are different from those of the above-noted $\text{Li}_x\text{Mn}_2\text{O}_4$ and thus cannot be replaced with Pynenburg et al. Also, since $\text{Li}_{x-y}\text{Ni}_{y-z}\text{Co}_{z-a}\text{M}_a\text{O}_{2-a}X_b$, described in Miyasaka naturally has a smooth discharge curve without steps, there would be no motivation to combine this complex oxide with that of Pynenburg et al. Accordingly, even a person having an ordinary skill in the art could not combine Miyasaka and Pynenburg et al. Thus, claim 5 of the present application cannot be rendered obvious over Miyasaka and Pynenburg et al.

Furthermore, the Examiner has asserted that the valence of Mn in the above-mentioned complex oxide disclosed in Miyasaka is an inherent physical property and thus it is reasonable to assume that the valence of Mn in Miyasaka's complex is 3.3 to 4 as presently claimed. This assertion is not correct as described below.

JP 11(1999)-307094 A (submitted concurrently herewith in an IDS) describes a complex oxide having a composition represented by $\text{Li}_{1-a}\text{Ni}_{1-b-c-d}\text{Mn}_b\text{Co}_c\text{M}_d\text{O}_2$ (where $-0.15 \leq a \leq 0.10$, $0.02 \leq b \leq 0.45$, $0 \leq c \leq 0.50$, $0 \leq d \leq 0.20$; and M is an element that is added in a slight amount). Further, as becomes clear from the following description:

[T]he heat generation suppressing effect of Mn composition is remarkably large in LiNiO_2 bone composite of the present invention, in Mn quantity $b \leq 0.02$, calorific value ratio is suppressed in as low as the target index of 30% or less, and calorific value approaches zero as the amount of composition increases to 0.45. It is thought that this fact results from the layer structure and bone stabilizing function derived from small ion radius and strong oxygen-affinity of Mn^{3+} compared with bone Ni^{3+} . (See paragraphs [0033] to [0034] of JP 11(1999)-307094 A).

Furthermore, JP 11(1999)-307094 A states:

[A]lthough exothermic peak shifts somewhat to higher temperatures by Co composition in LiNiO₂ bone composite of the present invention, the heat generation suppressing effect is relatively small, exhibiting an almost constant value to the amount of Co composition. It stems from the fact that Co³⁺ ion is smaller than Ni³⁺ to form solid solution easily, and also oxygen-affinity is Mn³⁺ > Co³⁺ > Ni³⁺. (See paragraph [0037] of JP 11(1999)-307094 A).

Thus, the valences of Ni, Mn and Co constituting the above-noted complex oxides are all 3. On the other hand, when M is Mn, the compositional ratios of the complex oxide of Miyasaka overlaps the compositional ratios of JP 11(1999)-307094 A where the ratio x of Li is in the range of 0.9 to 1.15. Thus, JP 11(1999)-307094 A shows that the valence of Mn of the complex oxide disclosed by Miyasaka does not necessarily fall in the range of 3.3 to 4.

In addition, Table 1 of US 2003/0087154 A1 (also enclosed with the IDS filed concurrently herewith) describes two complex oxides having the same composition represented by Li[Li_{0.03}(Ni_{1/2}Mn_{1/2})_{0.97}]O₂ (Example 1 and Comparative Example 1). The valences of Ni and Mn are 2 and 4, respectively in the complex oxide in Example 1 (see paragraph [0207]), whereas the valences of Ni and Mn are different from the above in the complex oxide in Comparative Example 1 (see paragraph [0209]).

Accordingly, even if the compositions of the complex oxides are the same, the valences of elements constituting them are not always the same. Therefore, there is no basis for the Examiner to conclude that the valence of Mn in the complex oxide disclosed by Miyasaka is inherently 3.3 to 4 as presently claimed.

As described above, claim 5 of the present application is not obvious over Miyasaka and Pynenburg et al. Since claim 5 of the present application is characterized by the valence of Mn that is not disclosed by Miyasaka, it should not be rejected under 35 USC § 103(a).

In addition, the patent to Gorge et al. has been cited for teaching the addition of secondary particles to the mixture of Miyasaka et al. In view of the fact that Gorge et al. fail to

teach or fairly suggest a lithium complex having the valence of Mn of 3.3 to 4, Gorge et al. do not cure the deficiencies of Miyasaka et al.

Moreover, claims 6 to 13, 20-28, 32, 35, 38 and 41 that depend (directly or indirectly) from claim 5 are further removed from the teachings of the cited references and as such, should not be rejected under 35 USC § 103(a), either.

Based on the foregoing, Applicants respectfully request withdrawal of all of Rejections (1), (2) and (3).

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq. Reg. No. 43,575 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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